

# **Development of Thermionic Energy Converter for Radioisotope Batteries**

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*Final CRADA Report*

**Experimental Operations and Facilities Division**

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prepared by  
Sergy Chemerisov  
EOF Division, Argonne National Laboratory

Participants: Atlas Energy Systems, LLC

9/23/19

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## Non Proprietary Final CRADA Report

For the Office of Scientific and Technical Information (OSTI)

**CRADA Number:** 17112

**CRADA Title:** Short-Form Cooperative Research and Development Agreement No. 17112

**CRADA Start Date** 6/12/2017 – **End Date** 6/12/2019

### DOE Program or Other Government Support

**Program office:** AMO Chain Reaction Innovations

**Program manager name:** John Carlisle

**Program manager phone or email:** Carlisle@anl.gov

### Participant(s)

**Participant 1 name:** Atlas Energy Systems, LLC

**Complete address:** 1413 Sherman Road Suite 100 Romeoville, IL 60446

**Participant 2 name:** Click or tap here to enter text.

**Complete address:** Click or tap here to enter text.

**Participant 3 name:** Click or tap here to enter text.

**Complete address:** Click or tap here to enter text.

### Argonne National Laboratory

Argonne PI(s): Sergey Chemerisov

### Funding Table

To add rows, right-click in bottom row and select "Insert" "rows above".

	Planned Funding	Actual Funding	In-Kind
Government	\$350,000	\$350,000	
Atlas Energy Systems, LLC	\$178,000	\$383,402	\$90,000
Enter Participant 2 here	\$	\$	\$
Enter Participant 3 here	\$	\$	\$
<b>Total</b>	<b>\$528,000</b>	<b>\$733,402</b>	<b>\$90,000</b>

### Nature of Work

#### Describe the research (summary of Scope of Work and principal objectives of the CRADA):

Research and development of new energy materials for thermionic power generation for both nuclear and non-nuclear applications. Research focused on novel nuclear power generation materials in the form of advanced nuclear thermionic converters as well as general development of non-nuclear based thermionic power generation systems. Experiments were conducted at the Van de Graaf accelerator facility at Argonne and at Atlas own facility. Proof-of-principle experiments at Van de Graaff accelerator demonstrated feasibility of the technology for direct heat to electricity conversion. Further development of thermionic converter is conducted at Atlas facility. Argonne designed the universal testing bench for testing of different materials/coating/surface modified cathodes for thermionic energy conversion.

**DOE mission area(s):**

Energy and Environmental Science and Technology  
Materials Science  
National Security

**Conclusions drawn from this CRADA; include any major accomplishments:**

Major accomplishment was the demonstration of a new type of nuclear power generation technology that has no moving parts. Initial development proved fruitful but final conclusions point to further development being needed.

**Technology Transfer-Intellectual Property****Argonne National Laboratory background IP:**

None

**Participant(s) background IP:**

Participant background IP is listed on the CRADA document

**Identify any new Subject Inventions as a result of this CRADA:**

None, the Participant's concepts were patented prior to the start of the CRADA

**Summary of technology transfer benefits to industry and, if applicable, path forward/anticipated next steps towards commercialization:**

Technology maturation and development provided proof-of-concept data needed for application to larger funding opportunities. These funding opportunities are being pursued jointly with Atlas and Argonne.

**Other information/results (papers, inventions, software, etc.):**

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## **Nuclear Engineering Division**

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